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FINLAND

Patents ADP number *(if you know it)*

6208193006

If the applicant is a corporate body, give the country/state of its incorporation

FINLAND

4. Title of the invention

A NETWORK

5. Name of your agent *(if you have one)*

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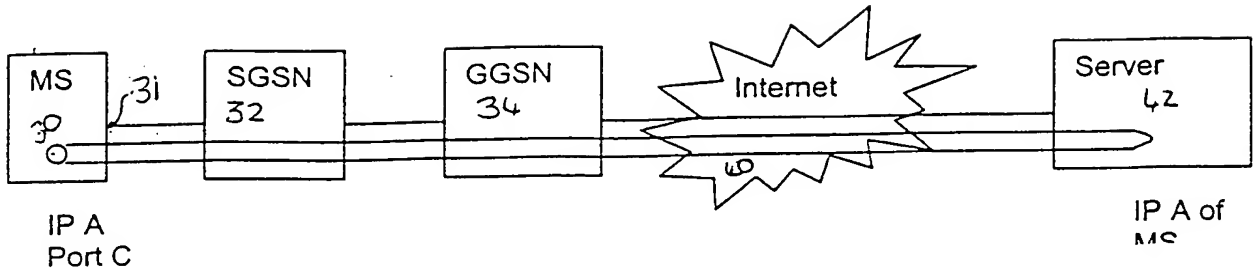

FIGURE 1

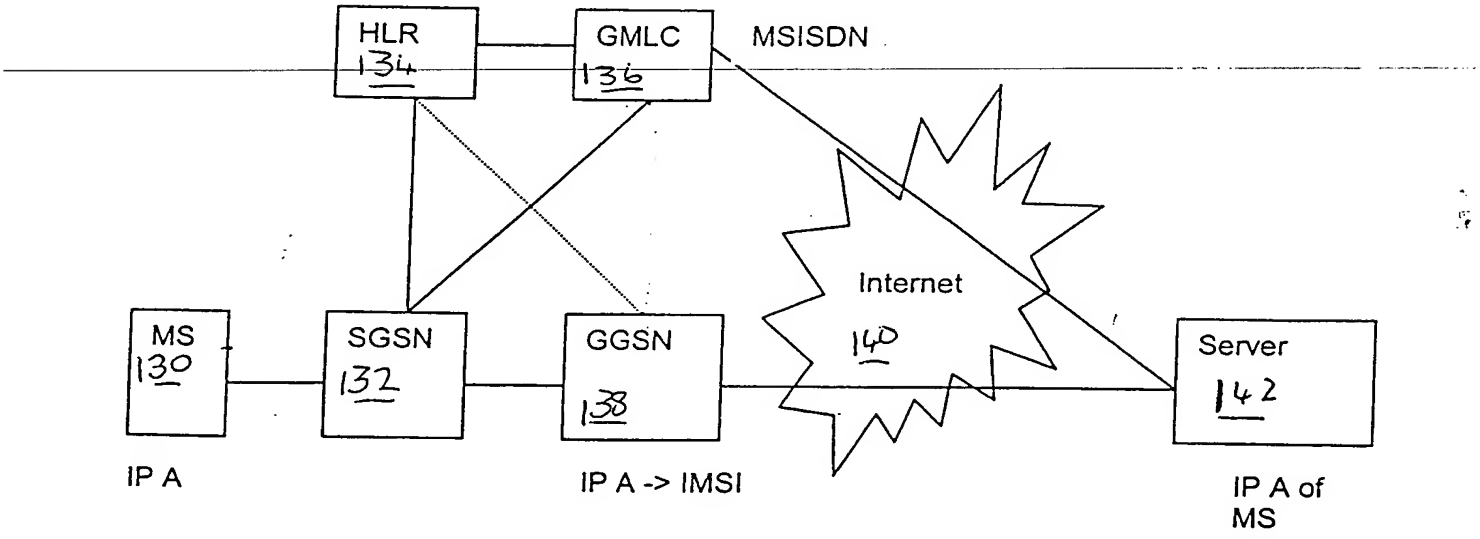

FIGURE 2.

A NETWORK

FIELD OF THE INVENTION

The present invention relates to a network and in particular but not exclusively to a packet data network such as GPRS.

BACKGROUND TO THE INVENTION

The General Packet Radio Service GPRS is a standard which relates to the transfer of data to and from mobile stations. The mobile stations are used in wireless cellular networks where the geographical area covered by the network is divided into a number of cells. Each cell has a base station which communicates with mobile stations or other wireless terminals located in the cell associated with the base station. Typically, the GPRS standard is provided in conjunction with the Global System for Mobile communications GSM standard. The GSM standard relates to speech services. There are elements of the GSM standard and the GPRS standard which are in common.

In the GPRS standard, the mobile station is assigned a PDP packet data protocol address by either a Home Public Land Mobile Network HPLMN or by a Visitor Land Mobile Network VPLMN. The HPLMN is the network of the network operator to which the mobile station subscribes. The VPLMN is the network in which a mobile station may be located but which is not his own network. A roaming agreement may be in place between the VPLMN and the normal (home) network operator.

The address is a dynamic Internet Protocol IP address. This means that the address is allocated when needed and then released when it is no longer needed. The same address can be used at different times by different mobile stations. This dynamic address will only be known by the elements involved in the allocation of the address and the mobile station, and will not be known by the home location register HLR which stores information on the mobile

station.

A server external to the GPRS system is able to communicate with the mobile station using the PDP address allocated to the mobile station. The server and the mobile station may communicate via the Internet, the IP address identifying the mobile station such that data from the server is sent via the Internet to the current network of the mobile station.

However if the server needs to know the location of the mobile station, it is difficult for the server to obtain this information as the address is a dynamic address, that is not unique to a given mobile station.

SUMMARY OF INVENTION

It is an aim of embodiments of the present invention to address this problem.

According to one aspect of the present invention, there is provided a network comprising a first station which is in communication with at least one network element, said first station being arranged, in use, to establish communication with an element external to said network via said at least one network element, wherein said external network is arranged to send a request for information on the location of the first station to said first station, said request being carried via the same means as user information from the external network to the first station.

BRIEF DESCRIPTION OF DRAWINGS

For a better understanding of the present invention, reference will now be made by way of example to the accompanying drawings in which:

Figure 1 shows a first embodiment of the present invention; and

Figure 2 shows a second embodiment of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS OF INVENTION

Reference is made to Figure 1 which shows a first embodiment of the present invention in a GPRS environment. The mobile station 30 is connected to a SGSN (serving GPRS support node) 32. The SGSN 32 keeps track of the mobile stations location and performs security functions and access control. The functions of the SGSN are defined in the GPRS standard.

The SGSN 32 is connected to a GGSN (gateway GPRS support node) 34. The GGSN 34 provides interworking with external packet switched networks. The GGSN thus acts as a gateway between the GPRS network and an external network. Again the functions of the GGSN are defined in the GPRS standard. In this embodiment, the GGSN 34 is connected to the Internet 40 via which the GGSN 34 can communicate with a server 42. The server may be the provider of a web site or the like. The GPRS network will include other GPRS network elements which are omitted for clarity. In some embodiments of the present invention, the SGSN and the GGSN are integrated into one physical element.

The mobile station 30 has a dedicated port 31, the function of which will be described hereinafter. This port may be TCP/IP port or a UDP/IP port. (TCP is the transmission control protocol, IP is Internet protocol and UDP is user datagram protocol. Both TCP and UDP are part of the TCP/IP suite maintained by the Internet Engineering Task Force IETF.)

The user of a mobile station 30 wants to access a web site of the server 42. The mobile station 30 therefore requests that an IP (Internet protocol) address be assigned to it. This request is made to the GGSN 34 via the SGSN 32. The GGSN 34 assigns an IP address to the mobile station 30. It should be appreciated that in this embodiment a different IP address is assigned to the mobile station each time a connection is made.

The mobile station then transmits a request packet to the server

42 which includes the address of the mobile station, the address of the server and information relating to the request for data. This packet is sent to the SGSN 32 which in turn forwards the packet to GGSN 34. The GGSN 34 forwards the packet to the Internet 40 which delivers the packet to the server 42 identified in the packet.

The SGSN 32 and the GGSN 34 may be transparent and the packet passed therethrough without modification. In this case, the address of the mobile station inserted in the packet by the mobile station will be the IP address. In the alternative, the GGSN 34 or the SGSN 32 may modify the format of the address of the mobile station before it is forwarded to the server 42. In the latter situation, data contained in the message is not altered. In particular, the GGSN 34 or SGSN 32 substitutes the mobile station's IP address for the address inserted by the mobile station.

The server 42 sends a reply packet to the mobile station 31 which includes the address of the mobile station, the address of the server and data requested by the mobile station. The GGSN 34 may be transparent to the reply packet, only identifying the mobile station from the IP address for which the message is intended and directing the reply packet to the correct mobile station. The SGSN 32 may also be transparent to the reply packet. In this case, the server will insert the IP address of the mobile station in the reply packet.

In alternative embodiments of the present invention, the GGSN 34 or SGSN 32 may modify the reply packet before forwarding the message to the mobile station. The data contained in the message would not be altered. Where the GGSN or SGSN alters the address of the mobile station in packets from the mobile station to the server, the GGSN or SGSN may alter the address of the mobile station in the packet from the server to the mobile station so that the IP address of the mobile station is substituted for the address used by the mobile station.

The messages which pass between the mobile station and the server are in packet format.

If the server 42 wants or needs to know the location of the mobile station a message is sent to the dedicated port 31 of the mobile station. This port is identified by the IP address and the port number. A different port is used for the request and reply packets. The server thus sends the position request to the dedicated port of the mobile station's IP address. The server knows in advance that if it wants to know the position of the mobile station it should send this request to a predetermined port of the mobile station. All mobile stations using the GPRS network may use the same dedicated port 31 for this positioning request. Alternatively the mobile station may include information in the request packet as to the dedicated port which should be used for location requests. The request for location information sent to the mobile station will be in packet form and will comprise the identity of the dedicated port 31 and the IP address of the mobile station.

The mobile station is configured so that it knows that any request which it receives at its dedicated port is a position request. When the mobile station 30 receives a position request from the server 42, the mobile station initiates a positioning determining procedure. The mobile station itself may calculate its position from information received from various of the network elements. Alternatively another network element may determine the position of the mobile station and provide that information to the mobile station.

The mobile station sends the position information back to the server 42 which uses it as required. This information is sent back via the dedicated port 31 of the mobile station.

In some embodiments, the mobile station can refuse to provide information on its position. The user may be provided with a message asking for confirmation as to whether or not information

on the position of the mobile station can be sent. The mobile station may have three modes:

1. the mobile station always provides information on its position in response to a request;
2. the mobile station does not provide information on its position; and
3. the mobile station sometimes will provided information on its position and at other times not. This may depend on the identity of the server or the user may check each request and makes a decision on a case by case basis.

Any one of these modes may be selected. Alternatively, the mobile station may only provide one or two of these modes.

A transmission and optionally a signalling plane are defined between the mobile station and the server. The request reply packets and the request for location and reply packets are both sent on the transmission plane.

Reference is now made to Figure 2 which shows a block diagram of a second embodiment of the present invention. The mobile station 130 is connected to a SGSN 132. The SGSN is connected to a HLR (home location register) 134, a GMLC (gateway mobile location centre) 136 and a GGSN 138. The home location register 134 stores information relating to the mobile station 130 such as the services to which the user has subscribed and the like as will as its MSISDN as will be described in more detail hereinafter.

The HLR 134 may also be connected to the GGSN 138 although this connection may not be present in alternative embodiments of the present invention. The GMLC 136 is a gateway between the GPRS network and the external networks such as the Internet. The external network may be an IP network or a different type of network. Again the function of the GMLC is defined in the GSM standard. The GGSN 138 and the GMLC 136 are both connected to the Internet 140. This allows the GGSN 138 and GMLC 136 to communicate with a server 142 via the Internet 140.

In this embodiment, the mobile station will be allocated an IP address as in the embodiment shown in Figure 1. Each mobile station will have either a real or a virtual dedicated port which is used when the server 142 requires position information from the mobile station. Where a virtual port is provided, this port will not actually exist in the mobile station. The dedicated port may have the same form as discussed in relation to Figure 1. The connection is set up in a similar manner to that described in relation to Figure 1. However, when the server 142 sends a request directed to the dedicated port of a given mobile station, this message is intercepted by the GGSN 138. The GGSN 138 uses the IP address of the mobile station to determine the mobile station's IMSI (international mobile subscriber identity). The GGSN 138 will have a register which stores the correspondence between the IP address of a mobile station and the IMSI. This is because the GGSN will have done the allocation of the IP address originally.

Using the IMSI information, the GGSN 138 requests the mobile station's MSISDN (mobile station International ISDN (Integrated serves Digital Network)) from the HLR 134. This is the telephone number of the mobile station. The MSISDN is then sent by the GGSN 138 to the server 142 via the Internet 140. The server 142 then sends a request to the GMLC 136 via the Internet 140 requesting the position of the mobile station associated with the MSISDN included in the message sent by the server 142 to the GMLC 136. The GMLC 136 then arranges for the position of the mobile station associated with the MSISDN to be determined. The position of the mobile station is established using the normal positioning procedures. Once the GLMC 136 has determined the position of the mobile station or has been advised of the position of the mobile station, this information is sent to the server 142 via the Internet 140.

In a modification to this embodiment, a connection is provided between the GGSN 138 and the GMLC 136. Once the GGSN 138 has obtained the MSISDN from the HLR 134, the GGSN 138 sends this

information to the GMLC 136 along with a request for the position of the mobile station associated with the MSISDN. When the GMLC has calculated or has received the position of the mobile station this is either sent back to the GGSN 138 or to the server 142 via the Internet 140.

If the position of the mobile station is sent back to the GGSN 138, the GGSN 138 forwards that information to the server 142 via the Internet. If the position of the mobile station is sent directly by the GMLC 136 to the server, the GGSN 138 will forward to the GMLC 138 information as where the information on the position of the mobile station is to be sent.

In a further modification to the invention, the GGSN 138 is provided with a dedicated port which is arranged only to receive position requests for mobile stations and to send information on the position back to servers.

In this modification a server will send a position request to the dedicated IP port in the GGSN. The information sent by the server to the dedicated IP port will include the IP address of the mobile station. As with the second embodiment, the GGSN 138 obtains the MSISDN from the HLR 134. The MSISDN is then used as in the second embodiment of the invention or its first variation.

The server 42 could provide a packet to the dedicated port containing requests for the positions of a number of mobile stations.

In the described embodiments of the invention, the mobile station is described as having a dynamic IP address, that is an address which changes between different connections of the mobile station. In alternative embodiments of the present invention, the mobile station may have a static IP address, that is an IP address which does not change between communications. In the second embodiments and the modifications thereof, a translator may be provided for translating the IP addresses into MSISDN

information. This translator could be provided in any suitable location. The location request procedure and the translation procedure may be combined into a single procedure. In the second embodiment and its modifications the location request procedure could be passed to the GMLC via the GGSN either directly or indirectly.

The server 42 may request the position of the mobile station for a number of reasons. For example a user may have ordered a taxi from a server and the taxi server want to know the location of the caller in order to send a taxi to the user. Alternatively the server may be a bus server. The user may have accessed the bus server in order to obtain bus timetable information. The server may request the position of the user in order to send to the user timetables relating to the current location of the user.

Within the transmission plane signalling a protocol for enquiring about the MS location may be conveyed. The protocol can be a specific protocol on top of a transport layer protocol (UDP/TCP) with its own port number or it can be part of an existing protocol and the MS location enquiry can be recognised using a specific message identifier within the existing protocol. Generally, the protocol is identified from the transport layer payload using an identifier in the transport layer protocol header. The protocol for enquiring about the location can also be intercepted from the transmission plane in the GGSN. This is the case in the second and third embodiments of the invention. Embodiments of the invention can be used with fixed network internet access servers. This means that whenever an internet access server recognises a specific user data enquiry protocol within the transmission plane it can check the user data associated with the access line (e.g. fixed network subscriber data such as calling line identifier) and send it to the enquiring user.

The location of the mobile station requested by the server may be the cell in which the mobile station is located or may be a

more exact procedure. Any suitable procedure may be used. For example the geographic location can be determined using positioning procedures such as E-OTD.

It should be appreciated that whilst the embodiments of the present invention have been described in the context of a GPRS network, embodiments of the present invention can be in the context of any other suitable network. Embodiments of the invention are particularly applicable to packet data networks. The data may be in accordance with the Internet protocol or similar packet data protocol.

Whilst embodiments of the present invention have been described in the context of a wireless network, embodiments of the present invention can also be used with wired networks.

The embodiments described hereinbefore have involved requests for the position of a mobile station. Embodiments of the invention are applicable to any other type of user equipment which may be mobile or stationary. The user equipment may comprise computer terminals.

CLAIMS

1. A network comprising a first station which is in communication with at least one network element, said first station being arranged, in use, to establish communication with an element external to said network via said at least one network element, wherein said external network is arranged to send a request for information on the location of the first station to said first station, said request being carried via the same means as user information from the external network to the first station.

2. A network as claimed in claim 1, wherein a transmission plane is provided between said first station and said external network, said request and user information being sent to the first station via the transmission plane.

3. A network as claimed in claim 1 or 2, wherein one of said first station and said at least one network element is provided with a dedicated address for receiving the request from said external network for information as to the location of the first station.

4. A network as claimed in claim 3 wherein information on the location of the first station is provided to said external network via said dedicated address.

5. A network as claimed in claim 3 or 4, wherein said dedicated address is a dedicated port within a user address.

6. A network as claimed in claims 3, 4 or 5, wherein the user information is received by and/or transmitted from a location in one of said first station and at least one network which is different to the dedicated address.

7. A network as claimed in any one of the preceding claims, wherein said first station is allocated an address, said address

being unique to said first station.

8. A network as claimed in any one of claims 1 to 6, wherein said first station is allocated an address, said address being reallocated to different first stations when no longer required by said first station.

9. A network as claimed in claim 8, wherein said address is allocated by said at least one network element.

10. A network as claimed in claim 3 or any claim appended thereto, wherein said dedicated address is located in said first station.

11. A network as claimed in claimed in claim 10, wherein said at least one network element is transparent to information sent between said first station and said external network.

12. A network as claimed in claim 10 or 11, wherein said first station is arranged to obtain information as to its position in response to a request received at its dedicated address.

13. A network as claimed in claim 12, wherein the first station is arranged to calculate the position of the first station.

14. A network as claimed in claim 12, wherein said first station receives information as to its position.

15. A network as claimed in any of claims 10 to 14, wherein said request from the external network includes information identifying the first station and the dedicated address.

16. A network as claimed in any of claims 10 to 15, wherein said at least one network element is arranged to check requests from the external network to the first station and if a request identifies the dedicated address, to initiate a procedure for providing information to the external network relating to the

position of the first station.

17. A network as claimed in any of claims 1 to 9, wherein said dedicated address is in said at least one network element.

18. A network as claimed in claim 16 or 17, wherein said at least one network element is arranged to obtain information identifying said first station in response to a request for the position from said external network.

19. A network as claimed in claim 18, wherein said information is the dialling number of said first station.

20. A network as claimed in claim 18 or 19, wherein said information identifying the first station is forwarded to a further network element, said further network element being arranged to provide information on the position of the first station identified by said information.

21. A network as claimed in claim 20, wherein said position information is provided to the external network by said further network element directly or via said at least one network element.

22. A network as claimed in claim 17 or 18, wherein said information identifying said first station is sent to the external network, said external network sending a further request to a further network element including said identifying information requesting information on the position of the first station, said information being forwarded to said external network.

23. A network as claimed in any of claims 18 to 22, wherein said at least one network element obtains said information on the identity of the first station from a register.

24. A network as claimed in any one of the preceding claims,

wherein said first station comprises a mobile station.

25. A network as claimed in any one of the preceding claims, wherein said network is a GPRS network.

26. A network as claimed in claim 25, wherein said at least one network element is a GGSN.

27. A network as claimed in claim 25 or 26 when appended to claim 18 or 20, wherein said further network element is a GMLC.

28. A network as claimed in any one of the preceding claims, wherein said external network is connected to said network via the Internet.

29. A network as claimed in any one of the preceding claims, wherein said network is a packet data network.

30. A network as claimed in any of the preceding claims, wherein said request for information on the location of the first station relates to the geographic location of said first station.

31. A network as claimed in any of the preceding claims, wherein said request for information on the location of first station causes a geographic positioning procedure to be started by said first station.

32. A network comprising a first station which is in communication with at least one network element, said first station being arranged, in use, to establish a connection with an element external to said network via said at least one network element, wherein one of said first station and said at least one network element is provided with a dedicated address for receiving a request from said external network as to the location of the first station.